

Key Factors Influencing the Adoption of Health Technology Through Applications in Thailand

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Abstract

Health technology applications have revolutionized healthcare by improving access, efficiency, and affordability. This study explores the factors influencing their adoption in Thailand using the Technology Acceptance Model (TAM) alongside demographic, social, and economic contexts. A cross-sectional survey involving 460 respondents revealed that perceived usefulness (PU), ease of use (PEOU), and behavioral intention (BI) are the primary drivers of adoption.

The findings highlight significant demographic disparities, such as higher adoption rates among younger, urban, and educated populations. Key motivators include reduced waiting times (85%) and cost savings on medical services and travel (70%). These factors collectively highlight the interplay of technology, user experience, and socioeconomic conditions in driving health application adoption in Thailand. This understanding provides actionable insights for developers and policymakers to address barriers and optimize adoption strategies. Challenges include high internet costs and digital literacy gaps, particularly for older adults and rural residents. Recommendations emphasize user-centered designs, trust-building measures, and targeted policies to enhance equitable access. This study provides actionable strategies for developers and policymakers to optimize health application adoption and improve healthcare delivery in Thailand.

Keywords: Technology Adoption; Health Applications; TAM; Digital Health; Cost Savings; Accessibility

Introduction

Digital health applications have emerged as transformative tools, reshaping how healthcare is delivered globally. These applications provide users with on-demand access to health information, remote consultations, and tools for managing chronic conditions, thereby improving healthcare accessibility, efficiency, and cost-effectiveness. The COVID-19 pandemic further accelerated the adoption of digital health technologies, highlighting their role in addressing healthcare challenges during emergencies. Applications such as telemedicine platforms, health monitoring tools, and vaccination tracking systems became indispensable in managing the pandemic response.

In Thailand, the government actively promoted the use of digital health tools, launching applications like MorChana and Doctor A-Z to support contact tracing and telemedicine services. These innovations demonstrated the potential of digital health applications to fill gaps in healthcare delivery, particularly in remote areas where access to physical healthcare services is limited. Despite these advancements, widespread adoption remains uneven due to various barriers.

One of the significant challenges is low digital literacy, particularly among older adults and rural populations, who may lack the skills or confidence to navigate digital platforms effectively. Additionally, data privacy concerns persist as users question the security and confidentiality of their sensitive health information. This issue is exacerbated by the limited implementation of stringent data protection regulations in some contexts, making users wary of sharing their health data.

Socioeconomic disparities further compound these barriers. For many low-income individuals, the cost of devices, internet access, and subscription fees for health applications can be prohibitive. This digital divide creates inequities in accessing technology-driven healthcare, leaving marginalized communities at a disadvantage.

While these challenges are significant, they also present opportunities for intervention. By understanding the factors influencing the adoption of health applications, developers and policymakers can design strategies to overcome these barriers. This study employs the Technology Acceptance Model (TAM), which provides a robust framework for exploring how perceived usefulness, ease of use, trust, and social influence shape technology adoption behaviors. The TAM framework has been widely used in various contexts to assess user acceptance of new technologies, making it a suitable foundation for examining health application adoption in Thailand.

This study employs the TAM framework to examine perceived usefulness (PU), ease of use (PEOU), and behavioral intention (BI) as drivers of health application adoption. By integrating demographic, technological, and economic factors, the study aims to:

1. Identify the key factors influencing adoption.
2. Explore barriers to widespread usage.
3. Offer actionable recommendations for enhancing accessibility and utility.

By achieving these objectives, the study seeks to contribute to the growing body of knowledge on digital health adoption and offer practical guidance for creating inclusive, user-friendly, and secure health technologies tailored to Thailand's unique cultural and socioeconomic context.

Materials and Methods

Study Design

A cross-sectional survey was conducted among 460 respondents using stratified random sampling to ensure diverse representation from urban, semi-urban, and rural areas.

Survey Instrument

The questionnaire, based on TAM constructs, included:

1. Demographics: Age, gender, education level, income, and digital proficiency.
2. Perceived Usefulness (PU): Assessing benefits like improved healthcare access and reduced costs.
3. Perceived Ease of Use (PEOU): Evaluating interface simplicity, navigation, and language support.
4. Behavioral Intention to Use (BI): Measuring willingness to adopt and continue using applications.

Measurement Scale The survey employed a 5-point Likert scale

Pilot Testing To ensure clarity, reliability, and cultural appropriateness of the questionnaire, a pilot test was conducted with 30 respondents. Feedback from the pilot test was used to refine the wording of questions and improve the overall structure of the survey. The final version was distributed to 460 respondents for the main study.

This structured instrument provided a robust framework for understanding the factors influencing health application adoption in Thailand.

Data Analysis Descriptive statistics summarized demographics and TAM constructs, while ANOVA and regression analyses examined relationships between variables. Statistical significance was set at $p < 0.05$.

Ethical Considerations Ethical approval was obtained from the Institutional Review Board at Rangsit University. Informed consent ensured participant confidentiality and voluntary participation.

Research summary

Demographics

Table 1 The survey data revealed the following key demographic characteristics of the respondents:

Data	Number	Percent
Gender		
Male	133	28.90%
Female	302	65.70%
LGBTQ	25	5.40%
Age		
18–25 years	182	39.50%
26–36 years	82	17.80%
36–45 years	86	18.70%
46–55 years	88	19.10%
56–65 years	22	4.80%
Education		
Under bachelor's degree	88	19.10%
Bachelor's or higher	209	45.30%
Postgraduate	163	
Monthly income		
Less than 15,000 baht	134	29.10%

Data	Number	Percent
15,001 – 25,000 baht	95	20.60%
25,001–35,000 baht	64	13.90%
35,001–45,000 baht	80	17.40%
More than 45,001 baht	87	18.90%
Residence		
Bangkok	240	52.10%
Perimeter	124	26.90%
Upcountry	96	20.80%
Living status		
Alone	101	21.90%
Living with family/relatives	357	77.40%
Stay with friends	2	0.4%
Devices that use health applications		
Smartphone	449	47.00%
iPad	253	26.50%
Notebook computer	187	19.60%
PC computer	67	7.00%

Table 2 Perceived Usefulness – PU

Key Factors Driving Adoption	Mean	Std. Deviation	Results
Health applications make access to medical services more convenient.	4.48	0.67120	Strongly agree
The application reduces the time required to wait in line or receive services from a hospital.	4.42	0.75266	Strongly agree
The application helps you to manage your health information efficiently.	4.35	0.70223	Strongly agree
Overall	4.42	0.60962	Strongly agree

The overall perception of the usefulness of technology was rated as "strongly agree" (Mean = 4.42). Specifically, health applications were rated highly for improving the convenience of accessing healthcare services, with a score of "strongly agree" (Mean = 4.48). Table 3. Perceived Ease of Use – PEOU

Table 3 Perceived Ease of Use (PEOU)

Key Factors Driving Adoption	Mean	Std. Deviation	Results
Applications are easy to use for non-tech-savvy users	4.20	0.78714	Agree
Easy to learn how to use the application	4.40	0.66405	Strongly agree
Applications have guidance or functions for convenience	4.35	0.73807	Strongly agree
Overall	4.31	0.62495	Strongly agree

In summary, the perception of ease of use was rated as "strongly agree" (Mean = 4.31). Among the items, the ability to quickly learn how to use the application scored the highest, with a rating of "strongly agree" (Mean = 4.40).

Table 4 Behavioral Intention to Use

Key Factors Driving Adoption	Mean	Std. Deviation	Result
Intend to use this application for health management in the future	4.32	0.75555	Strongly agree
Plan to use this application continuously in the long term	4.31	0.78232	Strongly agree
This application plays a significant role in your health management	4.33	0.77840	Strongly agree
Overall	4.32	0.68836	Strongly agree

The overall intention to use health applications was rated as "strongly agree" (Mean = 4.32), with the application's role in assisting health management scoring the highest at "strongly agree" (Mean = 4.33).

Table 5 Relationship Between Perceived Usefulness (PU) and Gender

Gender	Number	Mean	S.D.	F	Sig.
Male	133	4.53	0.53	13.45	<0.001
Female	302	4.33	0.64		
LGBTQ	25	4.88	0.30		

The ANOVA results ($F = 13.45$, $\text{Sig.} = <0.001$) indicate that differences in gender significantly affect perceptions of the usefulness of health technology applications in Thailand.

Table 6 Relationship Between Perceived Ease of Use (PEOU) and Gender

Gender	Number	Mean	S.D.	F	Sig.
Male	133	4.38	0.57	5.52	0.004
Female	302	4.26	0.65		
LGBTQ	25	4.64	0.40		

ANOVA results ($F = 5.52$, $\text{Sig.} = 0.004$) show that differences in gender significantly influence perceptions of the ease of use of health applications.

Table 7 Relationship Between Behavioral Intention (BI) and Gender

Gender	Number	Mean	S.D.	F	Sig.
Male	133	4.41	0.69	3.56	0.029
Female	302	4.26	0.70		
LGBTQ	25	4.56	0.33		

The ANOVA results ($F = 3.56$, $\text{Sig.} = 0.029$) indicate that gender differences significantly affect behavioral intention to use health applications in Thailand.

Table 8 Relationship Between Perceived Usefulness (PU) and Age

Age	Number	Mean	S.D.	F	Sig.
18–25 years	182	4.32	0.61	2.75	0.03
26–36 years	82	4.53	0.65		
36–45 years	86	4.48	0.74		
46–55 years	88	4.38	0.40		
56–65 years	22	4.62	0.37		

The ANOVA results ($F = 2.75$, $\text{Sig.} = 0.03$) indicate that age differences significantly influence perceptions of the usefulness of health technology applications in Thailand.

Table 9 Relationship Between Behavioral Intention (BI) and Age

Age	Number	Mean	S.D.	F	Sig.
18–25 years	182	4.32	0.61	2.67	0.03
26–36 years	82	4.53	0.65		
36–45 years	86	4.48	0.74		
46–55 years	88	4.38	0.40		
56–65 years	22	4.62	0.37		

The ANOVA results ($F = 2.67$, $\text{Sig.} = 0.03$) indicate that age differences significantly affect behavioral intention to use health applications in Thailand.

Table 10 Relationship Between Behavioral Intention (BI) and education

Education	Number	Mean	S.D.	F	Sig.
Under bachelor's degree	88	4.05	0.90	9.28	<0.001
Bachelor's or higher	209	4.41	0.67		
Postgraduate	163	4.36	0.53		

The ANOVA results ($F = 9.28$, $\text{Sig.} = <0.001$) indicate that education differences significantly affect behavioral intention to use health applications in Thailand.

Table 11 Relationship Between Perceived Usefulness (PU) and monthly income

Monthly income	Number	Mean	S.D.	F	Sig.
Less than 15,000 baht	134	4.31	0.64	4.38	0.002
15,001 – 25,000 baht	95	4.30	0.69		
25,001–35,000 baht	64	4.46	0.74		
35,001–45,000 baht	80	4.62	0.40		
More than 45,001 baht	87	4.48	0.44		

The ANOVA results ($F = 4.38$, $\text{Sig.} = 0.002$) indicate that differences in monthly income significantly affect perceptions of the usefulness of health technology applications in Thailand.

Table 12 Relationship Between Perceived Ease of Use (PEOU) and monthly income

Monthly income	Number	Mean	S.D.	F	Sig.
Less than 15,000 baht	134	4.30	0.67	5.98	<0.001
15,001 – 25,000 baht	95	4.31	0.65		
25,001–35,000 baht	64	4.30	0.72		
35,001–45,000 baht	80	4.58	0.47		
More than 45,001 baht	87	4.11	0.49		

ANOVA results ($F = 5.98$, $\text{Sig.} = <0.001$) show that differences in monthly income significantly influence perceptions of the ease of use of health applications.

Table 13 Relationship Between Behavioral Intention (BI) and monthly income

Monthly income	Number	Mean	S.D.	F	Sig.
Less than 15,000 baht	134	4.20	0.84	5.43	<0.001
15,001 – 25,000 baht	95	4.26	0.77		
25,001–35,000 baht	64	4.43	0.59		
35,001–45,000 baht	80	4.60	0.40		
More than 45,001 baht	87	4.25	0.51		

The ANOVA results ($F = 5.43$, $\text{Sig.} = <0.001$) indicate that monthly income differences significantly affect behavioral intention to use health applications in Thailand.

Table 14 Relationship Between Perceived Usefulness (PU) and residence

Residence	Number	Mean	S.D.	F	Sig.
Bangkok	240	4.49	0.55	5.11	0.006
Perimeter	124	4.28	0.71		
Upcountry	96	4.41	0.60		

The ANOVA results ($F = 5.11$, $\text{Sig.} = 0.006$) indicate that differences in residence significantly affect perceptions of the usefulness of health technology applications in Thailand.

Table 15 Relationship Between Perceived Ease of Use (PEOU) and residence

Residence	Number	Mean	S.D.	F	Sig.
Bangkok	240	4.35	0.55	4.83	0.008
Perimeter	124	4.17	0.71		
Upcountry	96	4.40	0.66		

ANOVA results ($F = 4.83$, $\text{Sig.} = 0.008$) show that differences in monthly residence significantly influence perceptions of the ease of use of health applications.

Table 16 Relationship Between Behavioral Intention (BI) and residence

Residence	Number	Mean	S.D.	F	Sig.
Bangkok	240	4.39	0.63	6.07	0.003
Perimeter	124	4.14	0.75		
Upcountry	96	4.40	0.70		

The ANOVA results ($F = 60.7$, $\text{Sig.} = 0.003$) indicate that residence differences significantly affect behavioral intention to use health applications in Thailand.

Factors Influencing Adoption

1. Perceived Usefulness (PU):

- Efficiency:

- 85% of respondents highlighted that health applications significantly reduced waiting times for consultations and medical services.

- Respondents reported faster access to healthcare services, particularly for routine tasks like appointment scheduling.

- Cost-effectiveness:

- 70% of respondents noted that using health applications reduced overall healthcare costs by minimizing travel expenses and time off work.

- Financial savings were particularly evident among rural users who previously needed to travel long distances for healthcare.

- Convenience:

- Respondents appreciated features like real-time health monitoring, automated appointment reminders, and digital health records, which streamlined healthcare management.

o Applications were viewed as a practical alternative for managing chronic diseases or regular follow-ups.

2. Perceived Ease of Use (PEOU):

• User-friendly Design:

o Applications that provided Thai language support and simple, intuitive user interfaces were more likely to be adopted, as reported by 78% of respondents.

o Accessibility features, such as step-by-step guides and tutorials, contributed positively to ease of use.

• Challenges:

o Approximately 60% of respondents faced difficulties with overly complex designs, particularly those requiring multiple steps to access basic functionalities.

o Some older adults expressed difficulty navigating applications due to limited digital literacy, highlighting the need for tailored solutions.

3. Behavioral Intention to Use (BI):

• Commitment to Long-term Use:

o A majority of respondents expressed strong intentions to use health applications continuously in the future, especially for health management and monitoring.

o Behavioral intention was strongly influenced by trust in the application's security and data protection measures.

• Influence of Social and Cultural Factors:

o Recommendations from family members, peers, and healthcare providers played a significant role in encouraging adoption, particularly among older users.

Additional Observations:

• Demographics and Adoption:

o Younger and urban respondents exhibited higher adoption rates compared to older and rural populations, reflecting disparities in access to digital resources.

• Economic Barriers:

o High internet costs and limited access to compatible devices were identified as significant barriers, particularly for low-income groups.

- Trust and Data Security:

- Concerns about data privacy and misuse were recurring themes, emphasizing the need for transparent and reliable security measures to build user trust.

- Application Features:

- Features such as multilingual support, real-time updates, and integration with existing healthcare services were identified as key facilitators of adoption.

These factors collectively highlight the interplay of technology, user experience, and socioeconomic conditions in driving health application adoption in Thailand. This understanding provides actionable insights for developers and policymakers to address barriers and optimize adoption strategies.

Discussion

This study reaffirms the relevance of the Technology Acceptance Model (TAM) in explaining the adoption of health applications in Thailand. Perceived usefulness (PU) and perceived ease of use (PEOU) emerged as significant predictors of behavioral intention to use these applications, consistent with TAM's theoretical underpinnings. Health applications were valued for their ability to enhance efficiency, reduce costs, and improve access to healthcare services. These benefits were particularly pronounced in contexts where users needed frequent consultations, chronic disease management, or access to remote healthcare services.

Influence of Demographic Factors

Demographic factors such as age, education, and income significantly impacted adoption rates, highlighting the persistence of digital inequities. Younger, urban, and highly educated users were more likely to adopt health applications, benefiting from greater digital literacy and access to technology. In contrast, older adults and low-income groups faced barriers such as limited familiarity with digital platforms and the prohibitive costs of devices and internet access. These findings align with previous studies that emphasize the role of socioeconomic factors in shaping technology adoption.

Barriers to Adoption

The study identified several barriers to adoption, including:

1. High Internet Costs: A recurring challenge, particularly for rural and low-income users, who often lack affordable and reliable internet access.

2. Digital Literacy Gaps: Older adults and users in less technologically advanced regions struggled to navigate complex application interfaces, underscoring the need for tailored digital literacy programs.

3. Data Privacy Concerns: Trust in data security emerged as a critical issue. Users were hesitant to adopt applications without clear assurances of privacy and protection against misuse.

Role of Social Influences

Social influences, such as recommendations from family members, peers, and healthcare professionals, played a pivotal role in encouraging adoption. This was particularly evident among older users, who relied on the guidance of trusted individuals to overcome hesitations regarding unfamiliar technology. Healthcare providers also emerged as key influencers, with their endorsements significantly increasing user confidence in the applications.

Design and Feature Implications

Applications that prioritized user-centric designs with features such as Thai language support, intuitive navigation, and real-time health monitoring were more widely accepted. However, 60% of respondents highlighted challenges with overly complex designs, emphasizing the importance of iterative user testing to ensure accessibility for diverse user groups.

Economic Motivators

The perceived cost-effectiveness of health applications, particularly in reducing travel expenses and saving time, was a critical motivator for adoption. Rural users, who previously faced long travel distances for healthcare, especially appreciated these savings. However, this benefit was less accessible to users who lacked the financial means to purchase compatible devices or sustain internet subscriptions.

Implications for Policy and Practice

To bridge digital inequities and maximize adoption, targeted interventions are necessary:

1. Subsidized Internet and Devices: Policies to reduce the financial burden of internet access and digital tools for low-income populations.

2. Digital Literacy Programs: Community-based initiatives focusing on older adults and rural residents to improve their ability to navigate health applications.

3. Trust-Building Measures: Transparent communication about data security and certification by trusted healthcare authorities to alleviate privacy concerns.

4. Healthcare Integration: Seamless integration of applications with existing healthcare services to enhance user experience and reinforce the perceived value of adoption.

Broader Implications

This study underscores the multifaceted nature of technology adoption in healthcare, where individual, social, and economic factors intersect. Addressing these factors holistically can lead to more equitable and sustained adoption, ultimately enhancing healthcare access and outcomes in Thailand. Future research could explore longitudinal adoption behaviors and focus on the inclusion of underserved groups, such as individuals with disabilities, to ensure broader applicability of health technology solutions.

Limitations and future research

This study has several limitations that should be acknowledged to contextualize its findings. First, the cross-sectional design limits the scope of the research to a single time point, making it difficult to assess changes in adoption behaviors or sustained usage patterns over time. The reliance on self-reported data introduces potential biases, such as social desirability bias, where respondents may provide answers they perceive as favorable rather than reflective of their true opinions or experiences. Additionally, the sample had a notable overrepresentation of urban and younger users, which restricts the generalizability of the results to older adults and rural populations. The study also focused solely on the constructs of the Technology Acceptance Model (TAM), potentially overlooking other influential factors such as cultural, organizational, or systemic dynamics that could impact adoption. Lastly, the absence of longitudinal analysis means the research does not account for the long-term adoption or sustained engagement with health applications.

Future research should address these limitations by incorporating more comprehensive and diverse approaches. Longitudinal studies are necessary to explore how adoption behaviors evolve over time and assess the long-term impact of health applications on healthcare outcomes. Including a more diverse population, such as rural residents, older adults, and other underserved groups, would provide a more representative understanding of adoption dynamics. Comparative studies across regions or countries could offer localized insights and highlight contextual differences in adoption behaviors.

Furthermore, integrating additional theoretical frameworks like the Unified Theory of Acceptance and Use of Technology (UTAUT) or the Health Belief Model (HBM) could provide a broader understanding of the factors driving adoption. Investigating specific application features that enhance usability and drive acceptance, such as personalization or gamification, would also be valuable. Economic impact analyses could strengthen the case for adoption by demonstrating cost-saving benefits for both users and healthcare providers. Lastly, intervention-based research, such as testing the effectiveness of digital literacy programs or subsidized internet initiatives, could provide actionable strategies to overcome barriers and promote widespread adoption.

In summary, addressing these limitations and pursuing the outlined research directions will enhance the understanding and implementation of health technology applications, enabling their more effective integration into diverse healthcare systems.

Conclusion

Adopting health applications in Thailand is shaped by a complex interplay of technological, demographic, and socioeconomic factors. This study highlights that perceived usefulness (PU) and perceived ease of use (PEOU) are critical drivers of behavioral intention to use health applications, validating the relevance of the Technology Acceptance Model (TAM). Younger, urban, and educated populations exhibited higher adoption rates, reflecting the impact of digital literacy and access disparities on usage patterns. However, barriers such as high internet costs, complex application designs, and digital literacy gaps, particularly among older and rural populations, hinder widespread acceptance.

To overcome these challenges, a multi-pronged approach is essential. User-centered designs must prioritize simplicity, language support, and accessibility to ensure inclusivity. Trust-building measures, including robust data security and transparent privacy policies, are crucial to alleviate user concerns. Additionally, policy-driven initiatives, such as subsidizing internet access and providing affordable devices, can help bridge the digital divide and ensure equitable access to health technology.

Collaborative efforts between application developers, healthcare providers, and policymakers are imperative to maximize adoption and impact. Developers should engage with end-users during the design process to align features with user needs, while policymakers must implement supportive

frameworks to facilitate adoption. Public health campaigns leveraging healthcare providers and community networks can further promote usage, particularly among hesitant populations.

In conclusion, by addressing the identified barriers and leveraging the drivers of adoption, health applications have the potential to transform healthcare delivery in Thailand. This transformation can lead to improved healthcare access, efficiency, and outcomes for all demographic groups, ultimately contributing to a more equitable and sustainable healthcare system. Future efforts should focus on long-term strategies to sustain adoption and expand the reach of digital health innovations across diverse population segments.

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